MICROSPACE COMMUNICATIONS CORPORATION
RADAR INTERFERENCE STUDY

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MICROSPACE RADAR INTERFERENCE STUDY

I. Background

Microspace Communications Corporation's mission is to provide professional satellite video, data and audio broadcast services for business applications. Microspace has grown steadily since its creation in 1988 from a single uplink antenna to multiple uplink antennas operating on multiple Ku-band and C-band transponders. Today, Microspace operates the world's largest satellite broadcasting network for business applications, now with over 300,000 remote downlinks.

Microspace serves many industries that this country relies upon. These industries include:

- The Paging Industry. Microspace serves paging carriers of all sizes. Approximately 8 million pagers rely upon Microspace satellite services every day. Hospitals rely on pagers in their care of patients. Emergency Medical Services rely on pagers every day. Police officers and fire fighters respond to emergency situations based upon reliable communications from their pagers.

- Financial Information Service Industry. Microspace serves fourteen financial information client networks delivering real-time stock market and commodity quotes, news and energy information to tens of thousands of locations all across the country.

- Weather Information Service Industry. Microspace serves four out of the six providers of North American weather information. They depend on satellite delivery for real-time updates to television stations. Among other applications, the television stations use this weather graphic information to make the American public aware and protect themselves from severe weather conditions, including thunderstorms, tornadoes, snow storms, hurricanes, etc. Often times, television stations will "cut-in" to regular programming with this real-time information. Additionally, television stations present "crawls" along the bottom of the screen providing current information. Television stations use this weather information to fulfill the FCC's public service requirements. Dependable satellite services are indispensable to the weather industry as a matter of public safety.

  The weather industry uses satellite services to deliver real-time weather graphics and text to the Federal Aviation Administration (FAA). The FAA uses this information as part of its advisory systems to commercial pilots. Similar content is delivered to FBO's where private pilots perform self-briefings to make their flight and course decisions.

- Business Music Industry. Microspace provides service to major providers of business music, including DMX Music and Muzak.

- Proprietary Services. Microspace provides independent applications that can not be highlighted here due to contractual confidentiality statements.

II. Technical Overview of Microspace Satellite Services And In General How Radar Detectors Interfere With Its Service

Microspace's satellite services are technically unique. While many of the previous filings before the FCC on the issue of radar interference have related to individual Single Channel Per Carrier (SCPC) networks, Microspace operates its services in full transponder Multi Channel Per Carrier (MCPC) mode. This means that Microspace fully saturates the transponder, thus using the maximum power and bandwidth in a single carrier. This maximum power is controlled by the satellite operator and regulated by the FCC. This Full-Transponder MCPC mode allows the Industries Served to use 0.9 meter and 1.0-meter antennas in typical downlink locations.

Microspace operates primarily in the Ku-band FSS frequency spectrum of 11.7 – 12.2 GHz. Microspace operates multiple transponders on multiple satellite operators in Full-Transponder MCPC modes. Microspace has independently verified the radar interference already reported to the FCC that is occurring on Loral/Skynet, PanAmSat and SES/Americom satellites. Microspace operates in the North American orbital arc from 89° West longitude to 103° West longitude.

Despite using the maximum power allowed by the satellite operator and the FCC, Microspace's clients are experiencing unusable services from their downlinks due to radar detector interference on multiple satellites.

III. Analog and Digital Transmissions are Impaired by Radar Detectors

Microspace operates Full-Transponder MCPC services in both the analog mode, as well as digital mode. Radar detectors are impairing both analog and digital Full-Transponder MCPC services.

In fact, the digital transmission mode Microspace utilizes is the internationally adopted, Digital Video Broadcasting (DVB) mode. Again, despite using internationally accepted broadcasting standards, Mcrospace's clients are experiencing unusable services due to radar detectors interfering with satellite downlinks.

IV. Demonstrated Interference: The Case of Muzak –An American Corporation Receiving Interference From Radar Detectors

For approximately 70 years, Muzak has been the industry leader in providing businesses with music, in-store messages and marketing on-hold. Throughout its history, many forms of technology have been utilized to deliver the content to the client and to create the experience that is right for it and its customers, the American public. In the late 1980's, Muzak began to utilize satellite services and placed one-meter antennas on the rooftops of its clients. Today, over 225,000 locations nationwide receive Muzak's services via satellite.

In mid-2001, Muzak introduced a new satellite-delivered streaming (live digital transmissions) music system designed to take advantage of new compression technology. The new platform also enables Muzak to create industry groundbreaking capabilities to better manage the network and serve the American retailers to promote an increase in commerce. These efficiencies and capabilities have become fundamental to the go-forward success and growth of the business and to obtain certain levels of economic achievement.

The new platform was met with much enthusiasm within the industry and Muzak began to move forward. Early on in the deployment of the new system, Muzak began to encounter unexplained signal degradation, outages and losses of service. Since the content is live, as opposed to occasional file transmission, these interruptions in service became very noticeable and rendered the product unacceptable in places of business. When the satellite signal is disrupted, the music and or advertisements chirp, cut-in, cut-out, skip, or simply mute all together. These results are simply not tolerated in places of business.

The interruptions, however, were intermittent. After weeks of trouble-shooting and analysis, Muzak was able to begin to document that the satellite signal was being interfered with on a random basis. Equipment was used to see and verify the interference occurring within the satellite frequency spectrum. Not only is the interference occurring within the new satellite platform (on Telstar 4 located at 89° west longitude), but also on the legacy platform (on the satellite Galaxy IIIR located at 95° west longitude). Both of these networks operate within the same FSS Ku-band. With the assistance of Microspace Communications (the satellite service provider), Wegener Communications (the satellite receiver vendor), Prodelin Corporation (the satellite antenna and LNB vendor) and others, Muzak learned of the radar detector interference. In fact, the type and frequency of the interference experienced by Muzak exactly parallels the interference that several satellite service providers have documented as being caused by radar detectors. Consider the following:

1. Muzak's footprint with respect to the number of satellite downlinks operating within the 11.7 to12.2 GHz band is substantial. Approximately 150,000 satellite downlinks are deployed in the United States alone.

2. Muzak's service is an "always on" service. The music is live 24 hours a day, 365 days a year across all time zones. Whereas some satellite services could experience interference in times when transmissions were not occurring, or experience interference during one download session of a multiple download process, Muzak cannot escape any period of interference. This means Muzak is more likely to be negatively impacted by the interference than those networks that are not "always on," even though the interference could be present on an occasional basis.

3. With respect to automobile radar interference, Muzak's downlinks are in high-risk locations. Muzak has an extremely high penetration of satellite downlinks in the fast food and convenience store industries. Both of these industries depend upon heavy automotive traffic. Furthermore, the real estate footprint of these businesses is relatively small. Additionally, these businesses are typically one story tall, therefore the downlink antenna is very close to the interfering radar detectors. Therefore, when you combine the heavy automotive traffic in these small parking lots with the antennas within only a few feet of the radar detectors in automobiles, the interfering radar detectors are causing the satellite downlinks to chirp, cut-in, cut-out, skip, and sometimes mute all together.

4. Even beyond the scope of these two industries, Muzak serves the retail marketplace where automotive traffic is required for commerce.

5. In addition to many retail locations, fast food restaurants and convenience stores, Muzak has had many satellite installations that do not work properly simply because these places of business are near heavily traveled highways and roadways.

The profile of Muzak's installation base and the discovery of the radar detector interference explains why Muzak has been impacted to such a serious degree. That the interfering radar devices are mobile, and that the interference has displayed itself in an intermittent manner, provides additional confirmation that radar detectors are the cause of the harm to Muzak's network of services.

Muzak has documented radar detector interference in cities across the nation, including:

- Jacksonville, Florida
- Chicago, Illinois
- Springfield, Illinois
- New Orleans, Louisiana
- Charlotte, North Carolina
- Fuquay Varina, North Carolina
- Wilmington, North Carolina
- Dallas, Texas
- And many others.

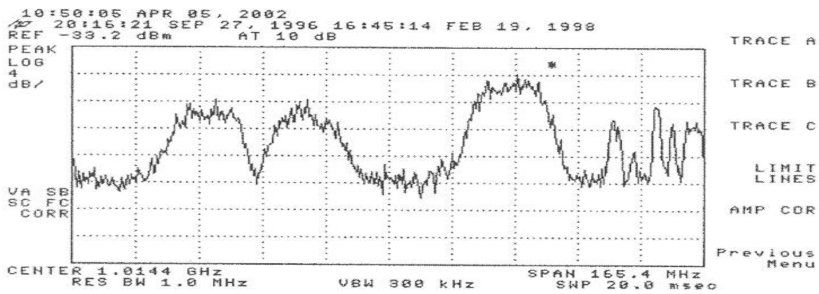
The following three pages are frequency plots that have been taken in the greater Charlotte, North Carolina, metropolitan area. The first plot (Normal T4 downlink carrier) shows the lower Ku-band FSS transponders on Telstar 4 operating in a normal field working environment. The subsequent five plots in different locals around Charlotte, NC, show how the radar interference is clearly overriding and damaging these FSS Ku-band frequencies, and subsequently the Muzak satellite delivered services.

This technical information was collected directly and under the supervision of Jeff Kelly, Director of Broadcast Operations at Muzak.

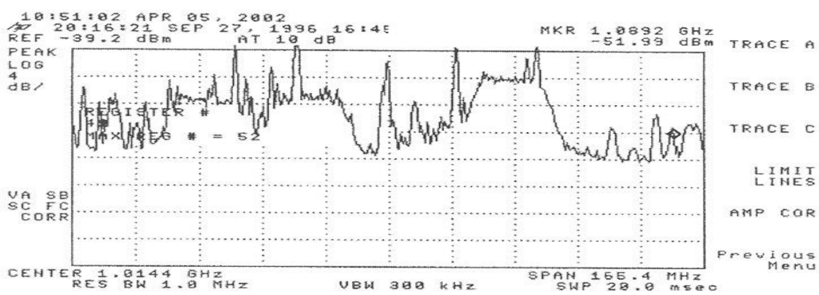
Charlotte Interference

The plots below were taken at several locations in Charlotte, NC. When the interference occurs, it stays present for about 8-10 seconds and then disappears. Each spike pops up individually instead of all at once. The interval is roughly every 4-5 minutes. When there isn't any interference, the spectrum looks like the first plot. Also, the plots below are exactly what I am seeing at multiple sites around the country.

All plots below were taken at L-band using an HP 8591E spectrum analyzer and using several different LNBs (including one PLL). The Tryon St./Tremont Ave. plot was also measured at Ku-band using an HP/Agilent 8564EC analyzer with a Ku-band LNA. In all but two cases, both analyzers displayed the same spikes at the same time and at the same frequency (LNB L.O. taken into consideration when comparing the frequencies at 12 GHz).

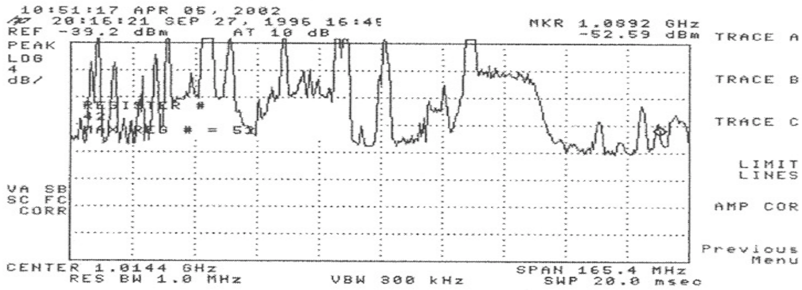


Normal T4 downlink carrier

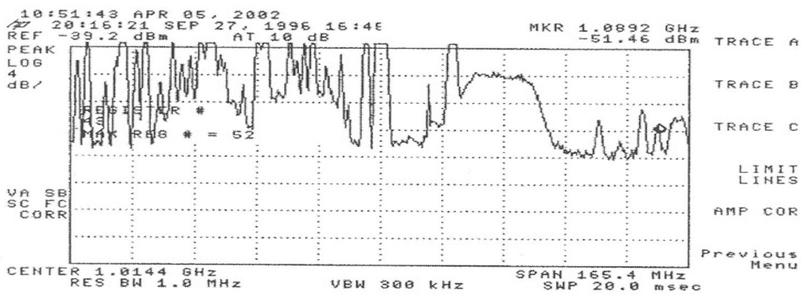


Tryon St . and I485

Charlotte Interference

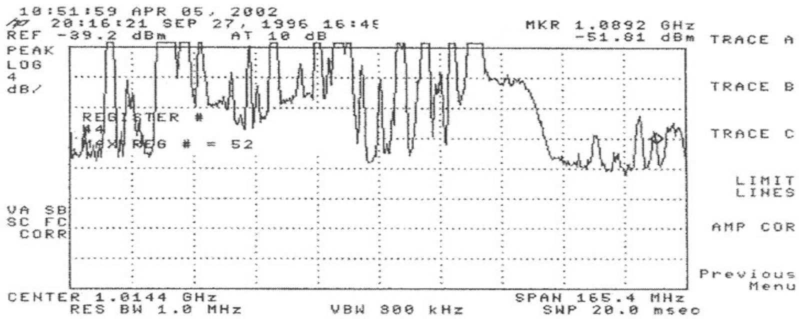


Charlotte – Tryon St. and Clanton Rd. (across from Adam 2 Police)

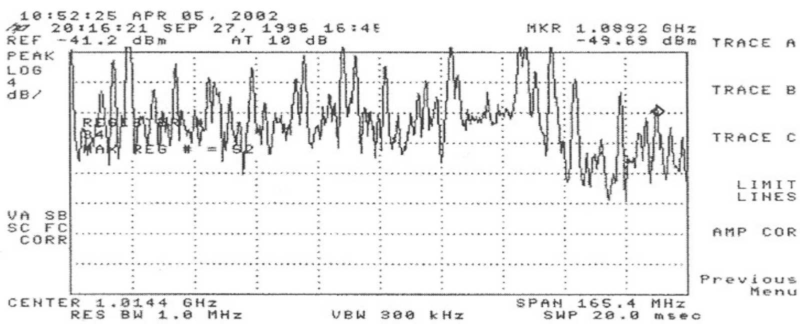


Tryon St. and Remount Rd.

Charlotte Interference



Tryon St. and Tremont Ave.



Independence and Sam Newell Rd.

The evidence of interference provided above is one example of many. Muzak serves every county in the nation. Muzak is convinced that radar detectors are interfering in the FSS Ku-band of frequencies. Muzak can no longer assure its clients that the satellite services they receive will deliver a high-quality signal. This lower integrity of service places its very business at risk. While other communication deliveries are available, they would involve additional significant expense to Muzak and the clients.

V. Weather Industry Being Impaired by Radar Devices

Microspace has been informed by multiple weather industry information providers that they have experienced FSS Ku-band satellite service interruptions due to radar detectors.

For example, a television relying on Microspace's service to obtain up-to-date weather information was able to directly correlate corruption to its downlink signal with the proximity of an employee's automobile containing a radar detector. The employee's automobile was parked near one of the two receiving dishes. The removal of the automobile terminated the corrupted signal.

A second case of weather content corruption occurred at an airport FBO location. These facilities provide private pilots with real-time graphical and text weather information. Again, the receiving site lost data. After much investigation, it was determined that the loss of data correlated with employee shift changes. An employee's car with a radar detector regularly parked near the receiving antenna. The corruption in the signal ceased once the employee disabled the radar detector when approaching the airport property.

These are two clear examples of American public safety placed at risk due to radar detector devices.

VI. Technical Documentation Illustrating Characteristics of Interfering Radar Devices

Microspace has taken some extraordinary steps to better understand the scale of the radar detection interference issue. These extraordinary steps include:

- Purchased multiple brands of radar detectors.
- Purchased multiple models of these brands of radar detectors.
- Performed evaluations with each model radar detector in the FSS Ku-band spectrum in an isolated antenna range test facility provided by Prodelin Corporation, a leading satellite antenna manufacturing company, in Conover, North Carolina. This range testing took place on April 23, 2002.
- Performed evaluations with each model radar detector in the FSS Ku-band spectrum in an isolated antenna range test facility provided by Channel Master, a leading satellite antenna manufacturing company, in Smithfield, North Carolina. This range testing took place on May 3, 2002.
- Evaluated the results of these range tests.

Microspace purchased the following radar detectors. The criteria of testing these particular units was based upon one criteria; the availability to purchase radar detectors at a large retailer. The radar detectors tested included:

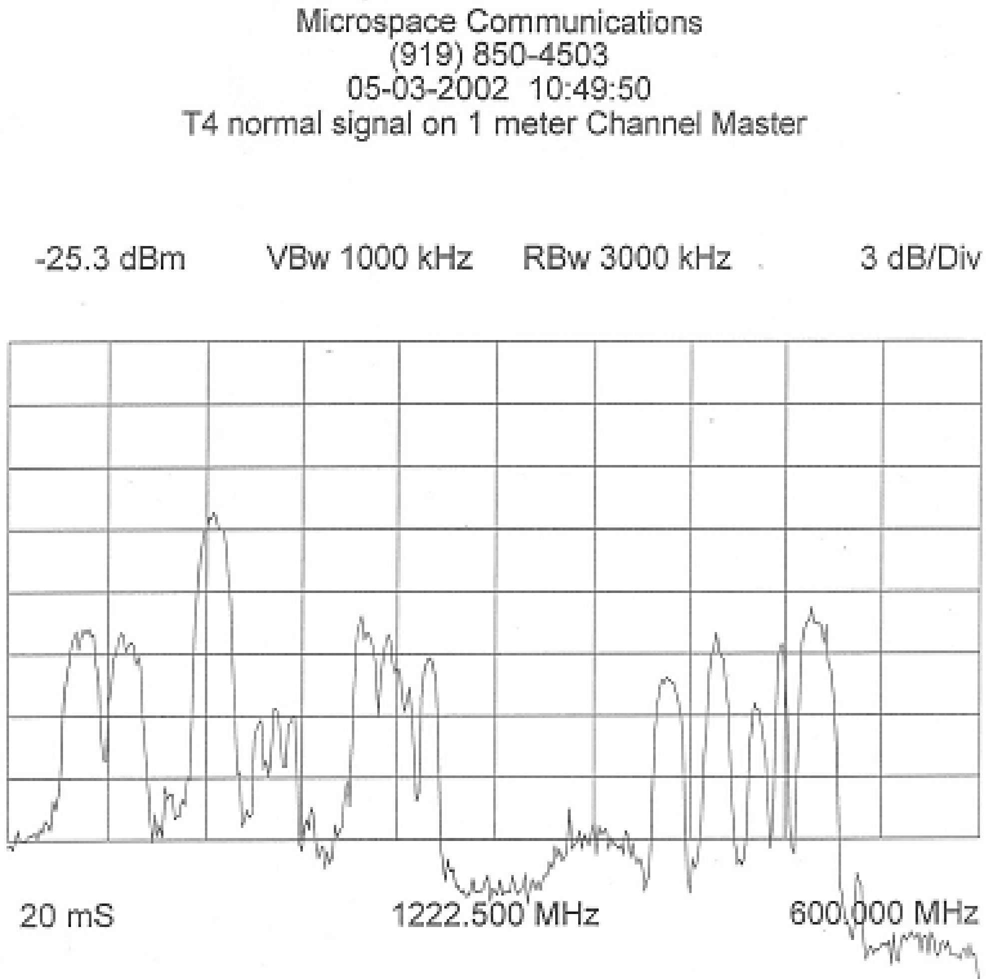
- Cobra model 9110
- Cobra model 9220

- Whistler model 1660
- Whistler model 1730
- Whistler model 1740
- Whistler model 1765
- Whistler model 1770

The next 12 frequency plots show the results of these evaluations.

This technical information was collected directly and under the supervision of Carolyn Newey, Director of Engineering and Operations, and Ron Burns, Chief Design Engineer, both of Microspace Communications.

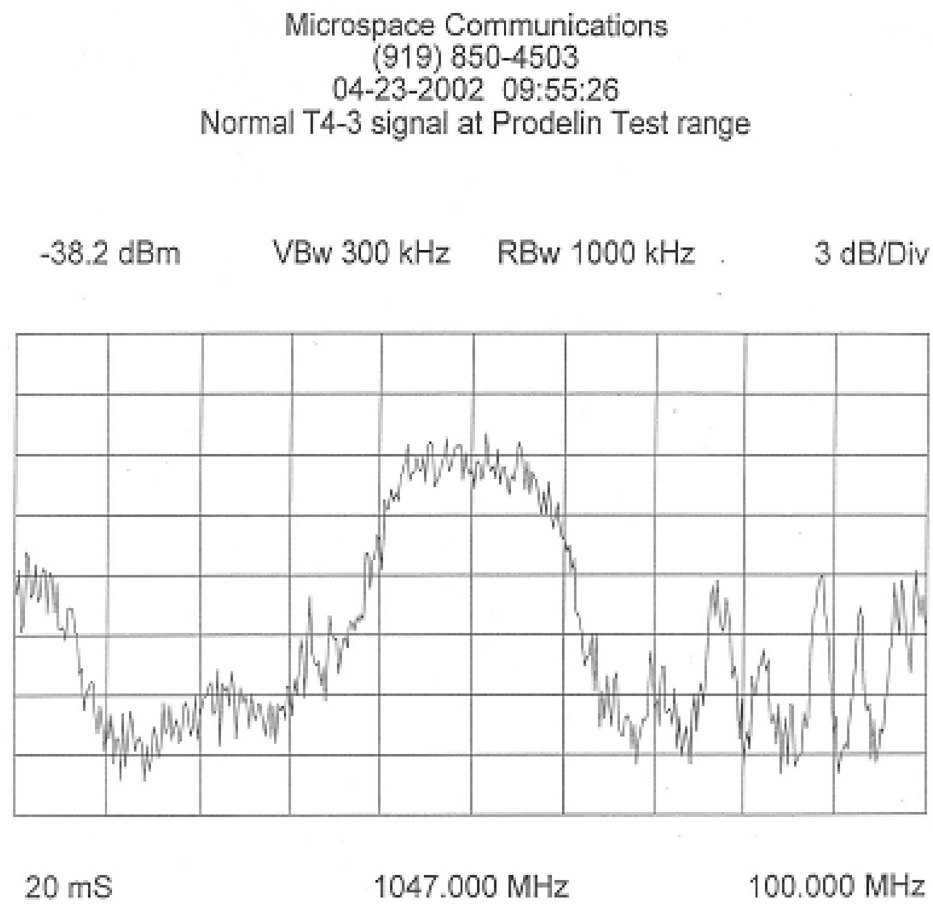
Plot 1:
T4 Normal Signal on 1 Meter Channel Master



This plot shows the full FSS Ku-band of the satellite Telstar 4 at the GEO orbital location 89° west longitude. From the left, the third peak signal is transponder 3, which is the full-transponder MCPC signal that Microspace operates.

This plot shows "clean" signals operating on Telstar 4 throughout the frequency range of 11.7 – 12.2 GHz. This is the benchmark frequency pattern for the entire frequency spectrum during the evaluations performed on May 3, 2002.

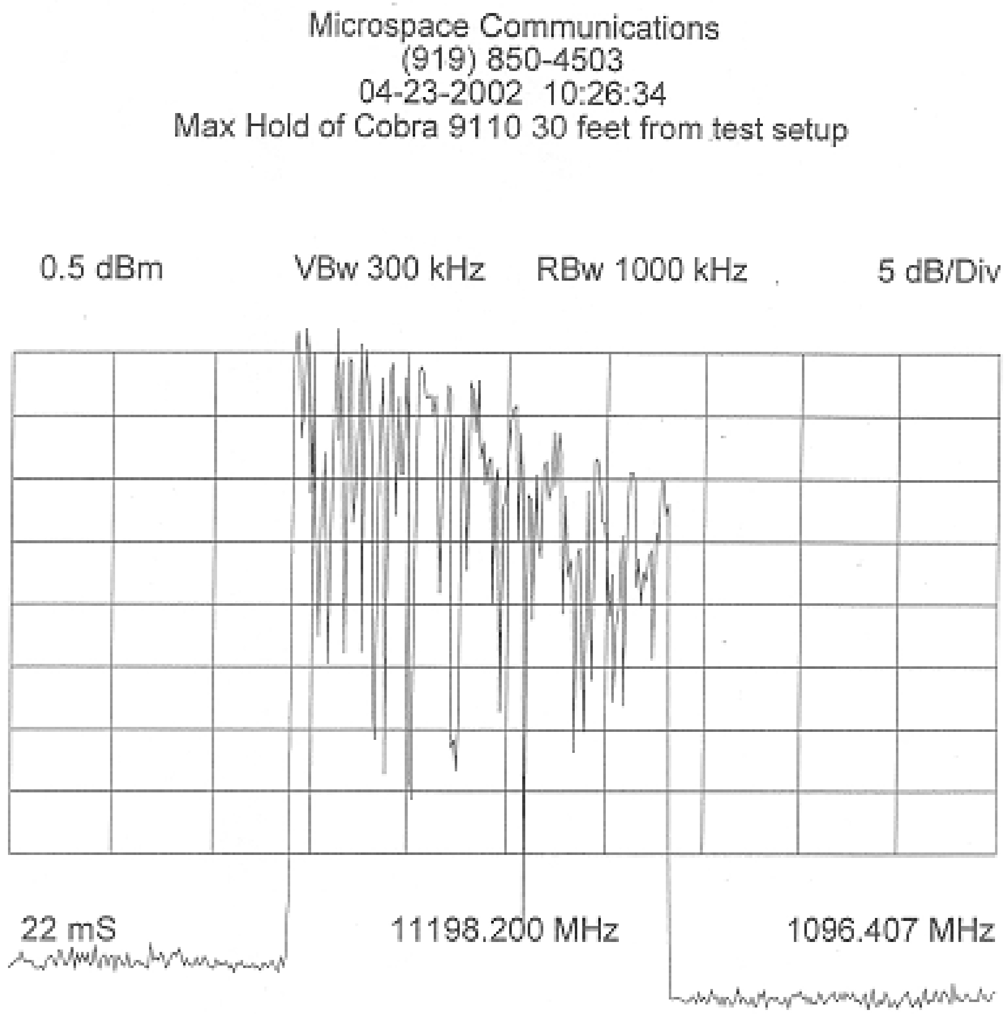
Plot 2:
Normal T4-3 Signal at Prodelin Test Range



This plot shows the full-transponder MCPC signal that Microspace operates on the satellite Telstar 4 at the GEO orbital location 89° west longitude.

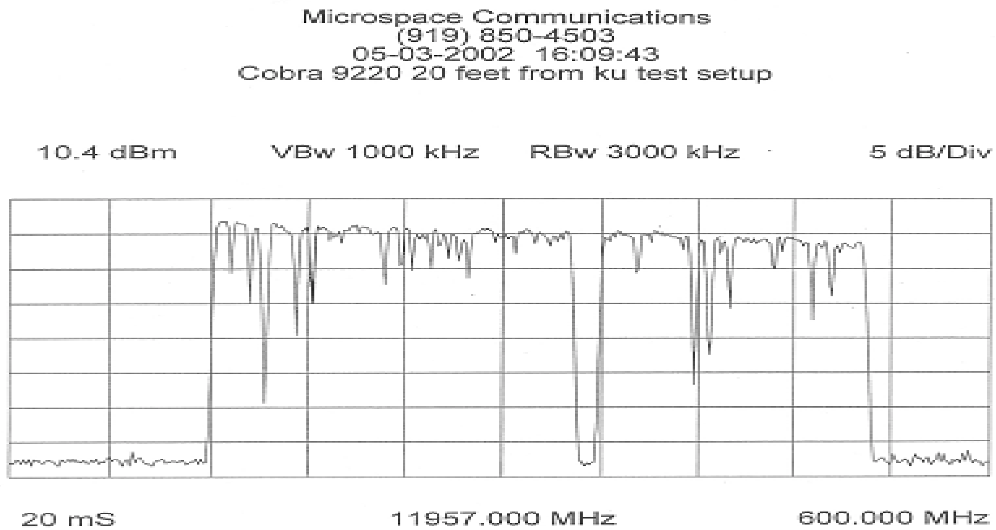
This plot shows “clean” signals operating on Telstar 4 Transponder Ku-3 operating at a carrier frequency of 11,797 MHz, or as displayed on the plot in L-band approximately 1,047 MHz. This is the benchmark frequency pattern for the individual transponder during the evaluations performed on April 23, 2002.

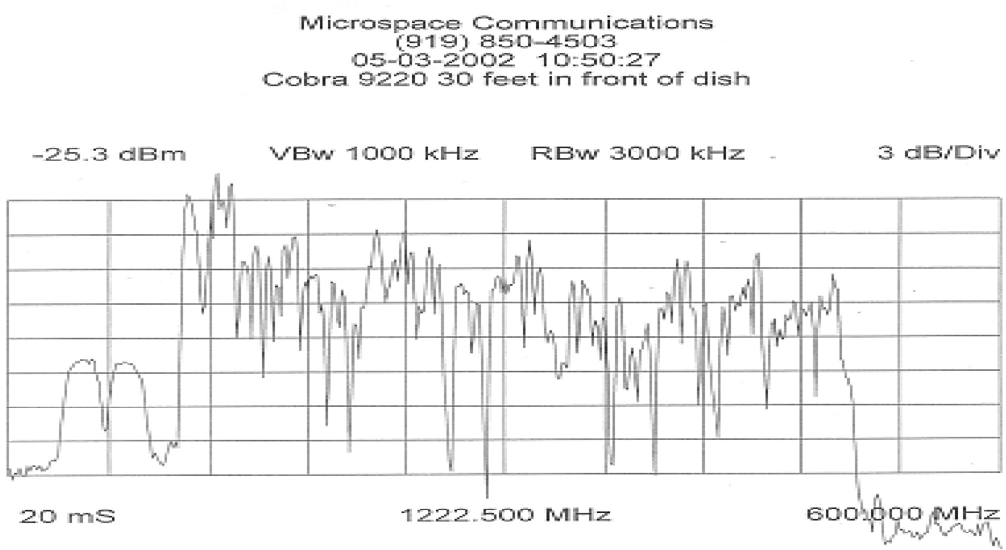
Plot 3:
Max Hold of Cobra 9110 30 Feet From Test Setup



This plot shows that the Cobra model 9110 emitting very high signals within the frequency range of approximately 10,880 – 11,380 MHz. This radar detector, while emitting signals that exceed emission standards normally applicable to other devices under Part 15 of the Rules, did not cause interference to the satellite signals because these extraordinary emissions take place outside the FSS Ku-band of 11,700 – 12,200 MHz.

Plot 4:
Max Hold of Cobra 9220 20 Feet From Test Setup

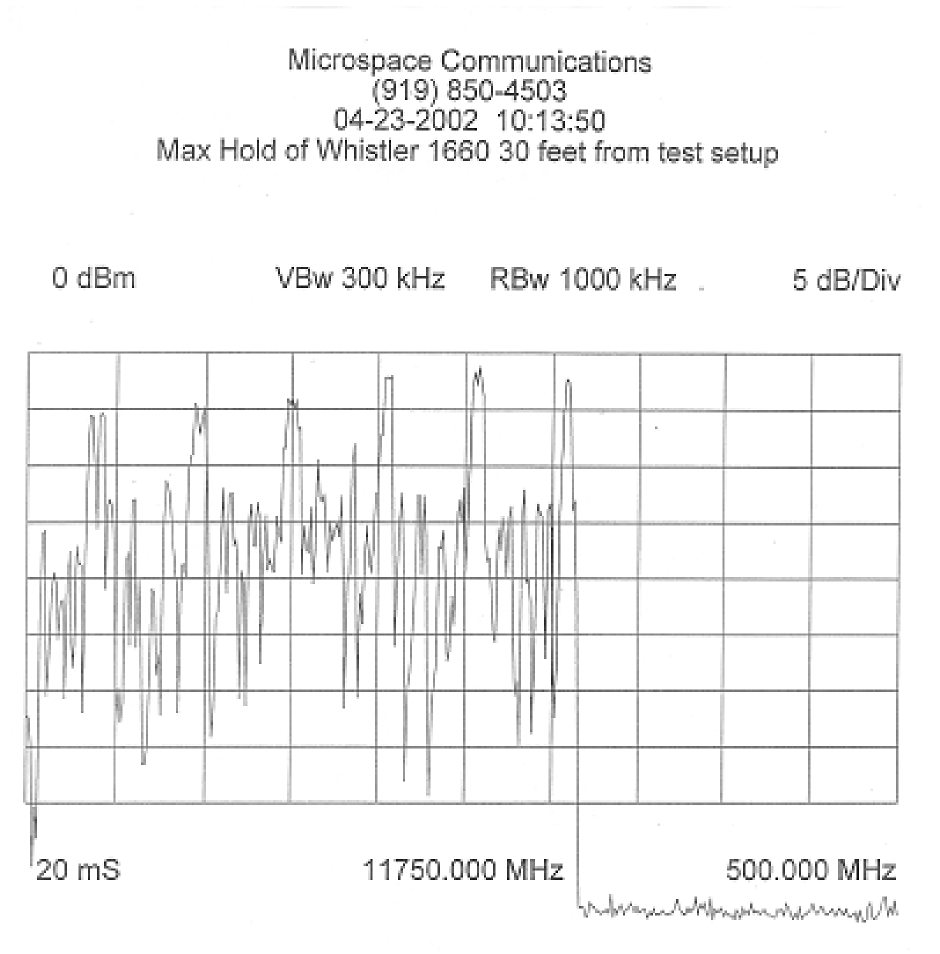




These plots show that the Cobra model 9220 emits very high signals within the frequency range of approximately 11,777 – 12,187 MHz. This radar detector did cause interference to all the satellite signals within the entire FSS Ku-band of 11,700 – 12,200 MHz. Furthermore, this radar detector clearly transmitted signals that exceed emission standards normally applicable to other devices under Part 15 of the Rules.

The radar detector Cobra model 9220 clearly overrides all the satellite signals seen in the benchmark of Plot 1.

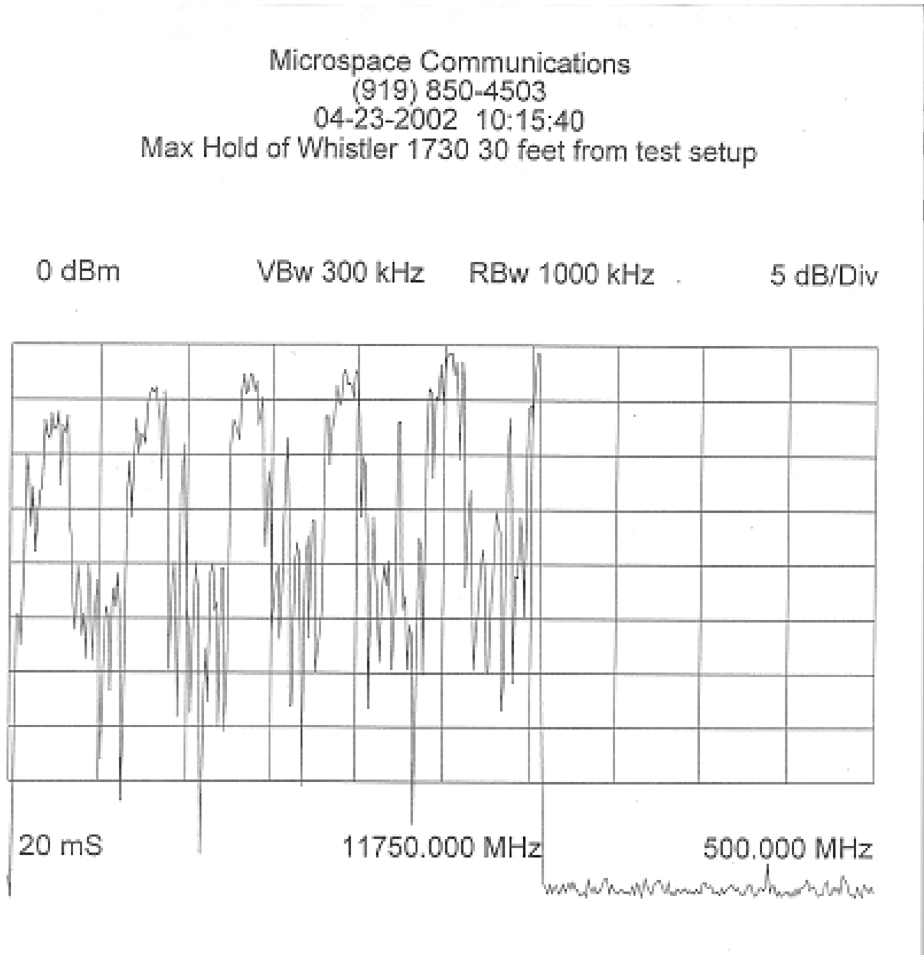
Plot 6:
Max Hold of Whistler 1660 30 Feet From Test Setup



This plot shows that the Whistler model 1660 is emitting very high signals within the frequency range of approximately 11,500 – 11,830 MHz. This radar detector did cause interference to the lower end of the satellite spectrum in the FSS Ku-band of approximately 11,700 – 11,830 MHz. Furthermore, this radar detector clearly transmitted signals that exceed emission standards normally applicable to other devices under Part 15 of the Rules.

Since the interference level from the Whistler model 1660 is in excess of Microspace's full transponder MCPC downlink level at the center frequency of 11,797 MHz, this radar detector clearly interferes with normal operation of the satellite receiver.

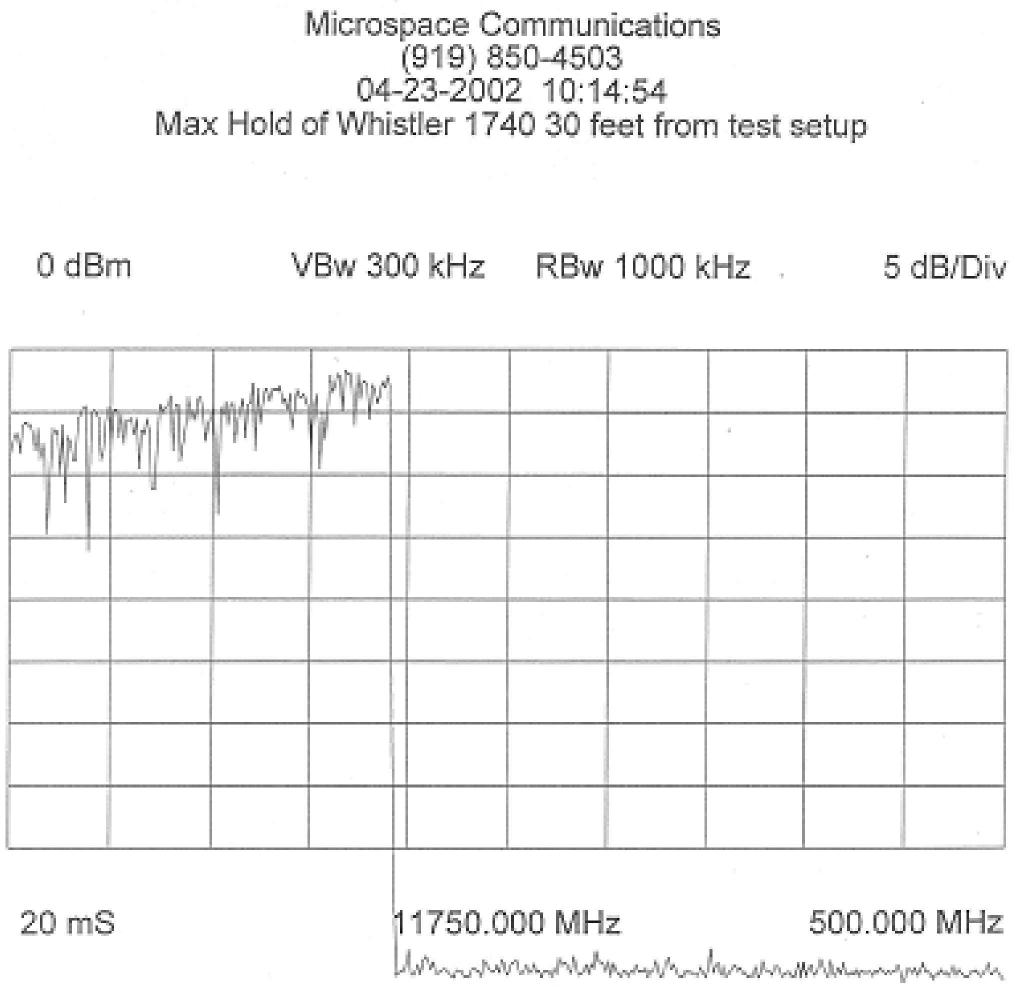
Plot 7:
Max Hold of Whistler 1730 30 Feet From Test Setup



This plot shows that the Whistler model 1730 is emitting very high signals within the frequency range of approximately 11,500 – 11,830 MHz. This radar detector did cause interference to the lower end of the satellite spectrum in the FSS Ku-band of approximately 11,700 – 11,830 MHz. Furthermore, this radar detector clearly transmitted signals that exceed emission standards normally applicable to other devices under Part 15 of the Rules.

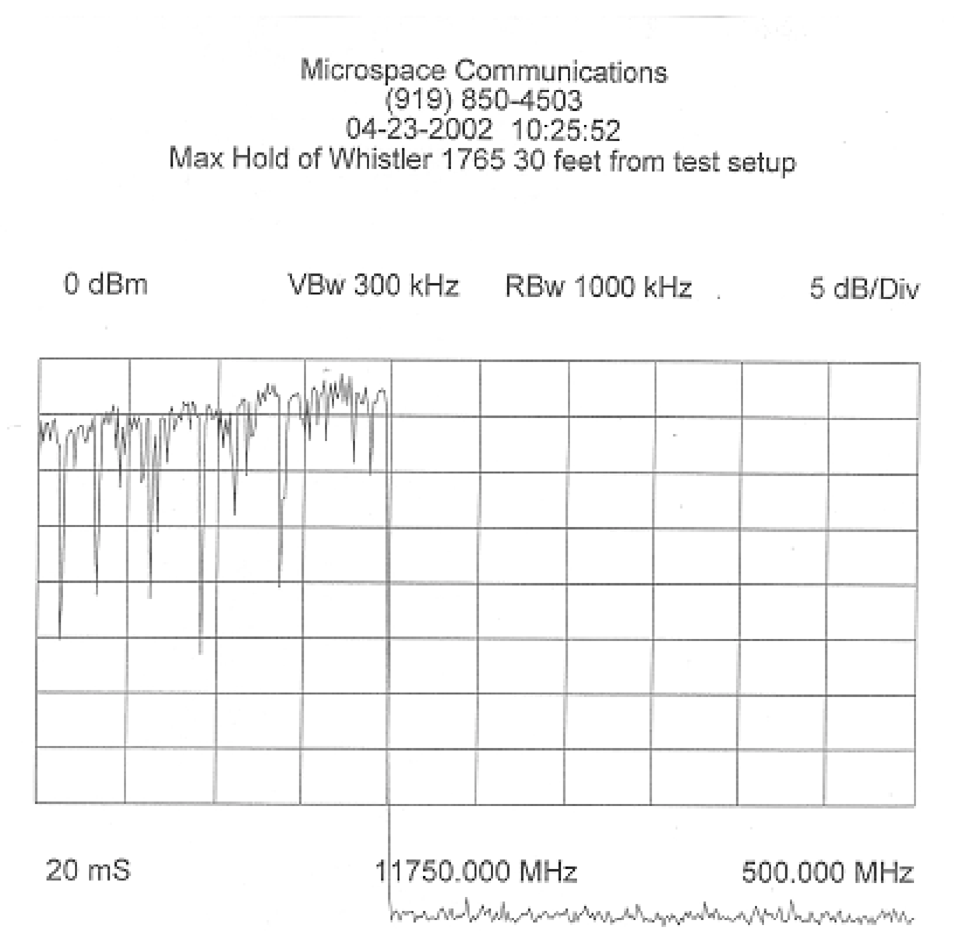
Since the interference level from the Whistler model 1730 is in excess of Microspace's full transponder MCPC downlink level at the center frequency of 11,797 MHz, this radar detector clearly interferes with normal operation of the satellite receiver.

Plot 8:
Max Hold of Whistler 1740 30 Feet From Test Setup



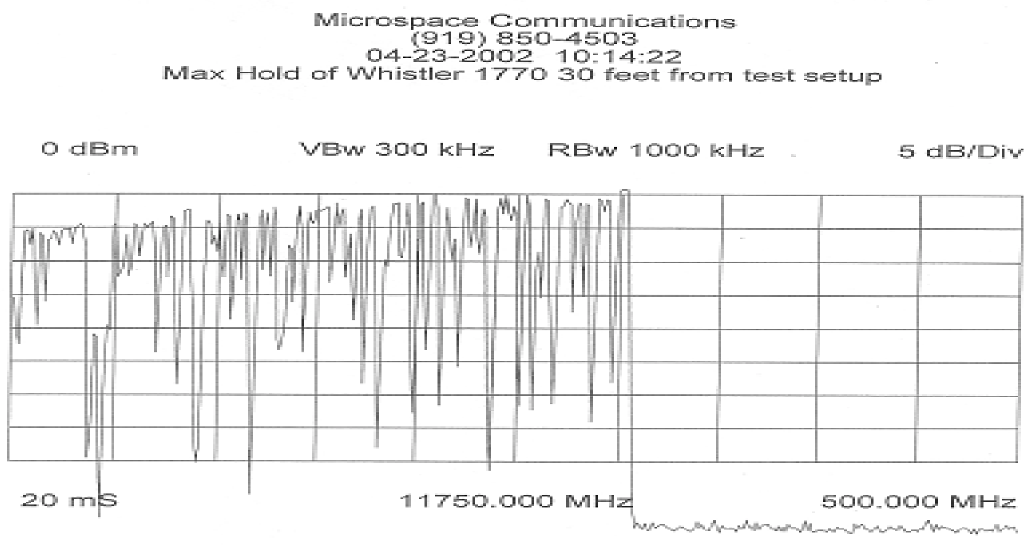
This plot shows that the Whistler model 1740 is emitting very high signals within the frequency range of approximately 11,500 – 11,690 MHz. This radar detector did not cause interference to the lower end of the satellite spectrum in the FSS Ku-band of approximately 11,700 – 11,830 MHz. However, this radar detector clearly transmitted signals that exceed emission standards normally applicable to other devices under Part 15 of the Rules.

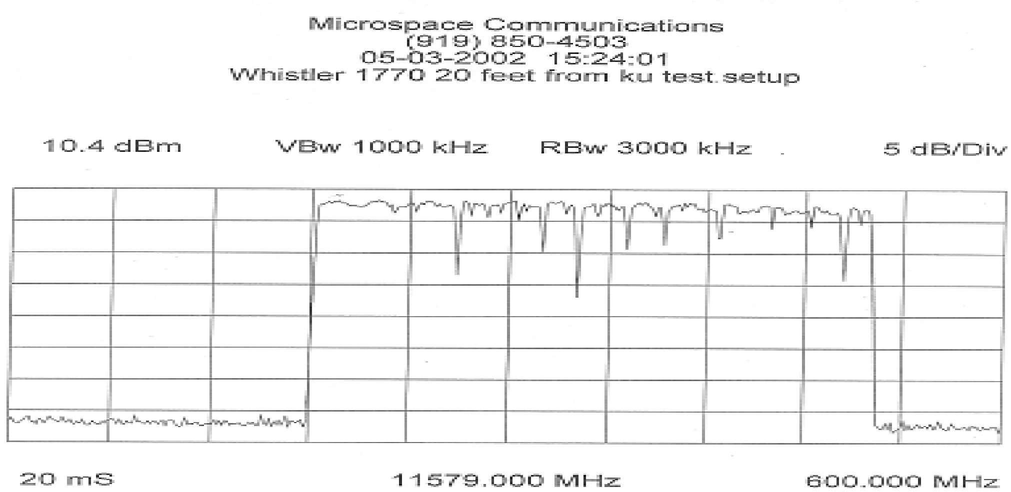
Plot 9:
Max Hold of Whistler 1765 30 Feet From Test Setup



This plot shows that the Whistler model 1765 is emitting very high signals within the frequency range of approximately 11,500 – 11,700 MHz. This radar detector did not cause interference to the lower end of the satellite spectrum in the FSS Ku-band of approximately 11,700 – 11,830 MHz. However, this radar detector clearly transmitted signals that exceed emission standards normally applicable to other devices under Part 15 of the Rules.

Plot 10:
Max Hold of Whistler 1770 20 Feet From Test Setup

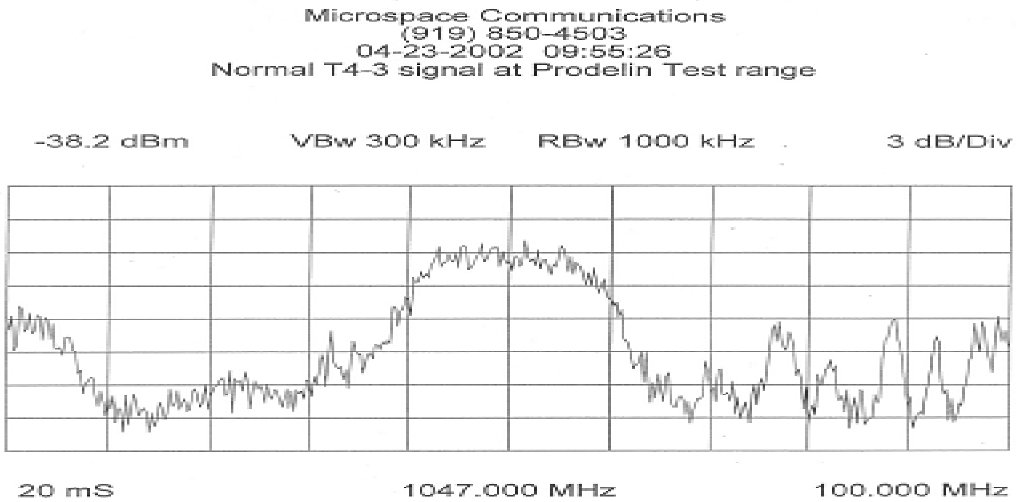


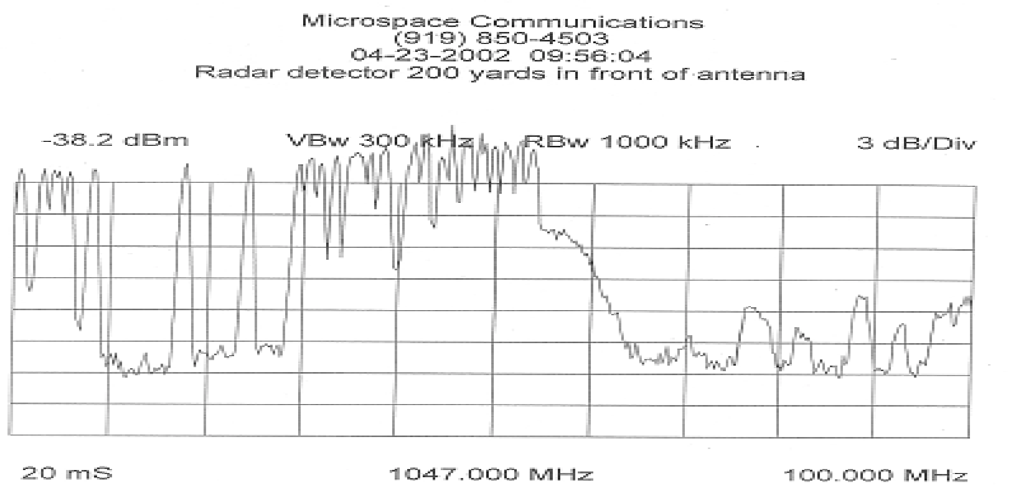


These two plots show that the Whistler model 1770 is emitting very high signals within the frequency range of approximately 11,459 – 11,800 MHz. This radar detector did cause interference to the lower end of the satellite spectrum in the FSS Ku-band of approximately 11,700 – 11,830 MHz. Furthermore, this radar detector clearly transmitted signals that exceed emission standards normally applicable to other devices under Part 15 of the Rules.

Since the interference level from the Whistler model 1770 is in excess of Microspace's full transponder MCPC downlink level at the center frequency of 11,797 MHz, this radar detector clearly interferes with normal operation of the satellite receiver.

Plot 11:
Whistler 1730: Radar Detector 200 Yards in Front of Antenna

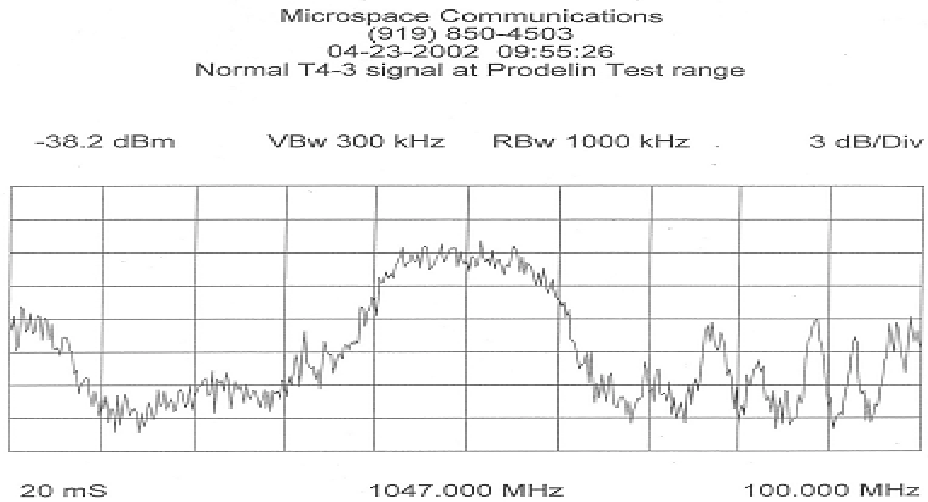


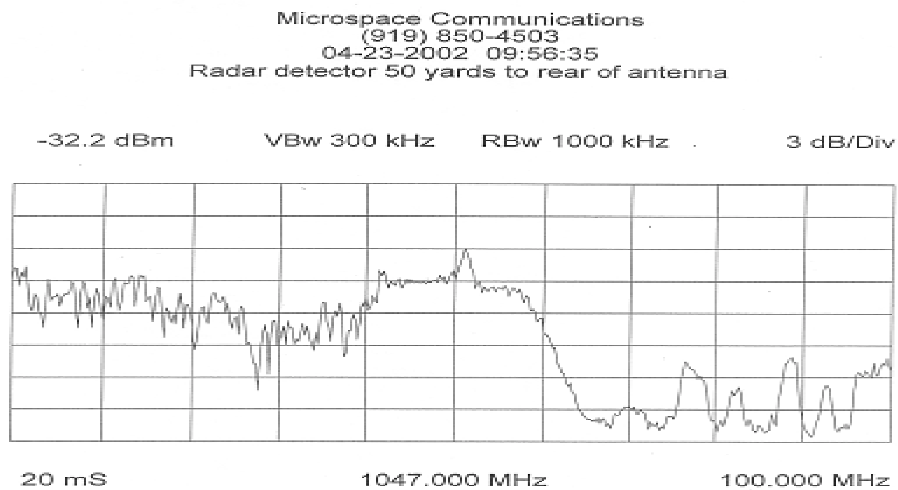


This plot shows the Whistler model 1730 (previously shown in Plot 7) positioned 200 yards in front of a typical 1.0 meter downlink antenna. It is visually very clear to see how these radar detector emissions are overriding the satellite signal.

With the interfering carrier present, the satellite signals, up to approximately 11,830 MHz, can not be detected or decoded, EVEN WHEN THE RADAR DEVICE IS 200 YARDS FROM THE DOWNLINK ANTENNA.

Plot 12:
Whistler 1730: Radar Detector 50 Yards to Rear of Antenna





The radar detector interference is being generated in an omnipresent mode. Since the interfering signal is so strong when positioned in front of an antenna, a test was performed placing the same radar detector, Whistler model 1730 (previously shown in Plot 7 and Plot 11) 50 yards behind the same typical 1.0 meter downlink antenna.

Again, it is visually very clear to see how these radar detector emissions are overriding the satellite signal.

With the interfering radar detector present, the satellite signals, up to approximately 11,830 MHz, can not be detected or decoded, EVEN WHEN THE RADAR DEVICE IS 50 YARDS BEHIND THE DOWNLINK ANTENNA!

VII. Summary of Radar Detectors Tested

To repeat, this is a random sampling of radar detectors in the marketplace today. The radar detectors tested included:

Radar Detector	Interfered in FSS Ku-band	Exceed Part 15
Cobra model 9110	No	Yes
Cobra model 9220	Yes	Yes
Whistler model 1660	Yes	Yes
Whistler model 1730	Yes	Yes
Whistler model 1740	No	Yes
Whistler model 1765	No	Yes
Whistler model 1770	Yes	Yes

Of the seven radar detector models tested, four clearly interfered in the FSS Ku-band. That equates to 57.1% of the tested units interfere in the FCC protected spectrum allocated for satellite receiving equipment.

Additionally, all 100% of the units tested exceed the Part 15 emission levels.

In combination with the real-world "Charlotte Interference" frequency plots along with the range testing, radar detectors are interfering in the FSS Ku-band of satellite spectrum!

The data shows that the radar industry can produce units that do not interfere in the satellite bands.

VIII. Conclusion

Many brands and models of radar detectors are interfering in the FSS Ku-band frequency spectrum. This is being seen in the real world, as well as being confirmed in laboratory test environments. The interfering radar detectors are impeding satellite service providers from providing reliable satellite communications to critically important industries and Americans throughout the nation.